Art. VII.—*Remarks on a Fossil Implement and Bones of an Extinct Kangaroo.*

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(With Plate VII.).

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All who have given intelligent thought to the history of Australia in the past, onward from the time of her greatest amplitude of animal life, have doubtless marvelled to find that of antique man no traces, such as are frequent in most other regions of the earth, have been discovered on or beneath her surface. In search of her material wealth that surface has been explored over a great part of its extent and proved to all reasonable depths, yet not a bone, not a handiwork of the most imperishable nature, to which a geological or even archæological interest can really attach, has been brought to light. We have nothing to clearly demonstrate man's existence in the land while its superficial features were in course of modification, nothing to suggest that the legendary lore of the Aborigine may be something more than the spontaneous creation of savages without a local history. Had such relics been extant we should almost necessarily have read in them, so far as we could read aught in them, the history of the forefathers of the so called Aborigines. The want of them has had this consequence, that the Australian "Negroid" has been pretty generally assumed to be a forlorn alien—an involuntary immigrant into unoccupied territory in comparatively recent times, and in the asserted absence of signs of kinship with nearer neighbours, has been pronounced by authority, more or less reliable, to be genetically related to various distant races, notably to the Dravidian Hill Tribes of India. Perhaps it is not too venturesome to hint that speculation of the kind has led to no satisfactory conclusion; the coincidences of word and grammar, and even of skull-characters, have not carried conviction to the mind—that in point of fact the derivation

of the native race is as much a mystery to us as ever. So far as we positively know, it is quite as likely that it was contemporary, in a general sense, with the Cave Men of Europe as that it resulted from a migratory wave of much later date, which threw it ashore under conceivable, but not very probable, circumstances. Balanced in this uncertainty we have not ceased to cherish the hope that a fortunate accident would at length remove it by uncovering some sign of an older stratum of humanity beneath our feet, and by the same token held ourselves prepared to scrutinize with as much impartiality as caution any claim in its behalf made upon our judgment. In presence of a fossil which has been most kindly entrusted to the writer by its first inquisitors, the Hon. R. T. Vale, M.P., chairman of the Local Board of the Buninyong Mining Company, Ballarat, and Mr. T. S. Hart, M.A., of the Ballarat School of Mines, it would now really seem to him that such evidence is forthcoming, notwithstanding the antecedent improbability established in his mind by failure to find a trace of man heretofore among relics of ancient life. At first sight the fossil appears to have been intentionally shaped to adapt it to some instrumental use. It may, then, be convenient to confirm this first impression by pointing out the marks of human workmanship which it has, with more loss certainty, preserved to us. It consists of part of the distal half of a right rib, the seventh or eighth, of an animal so large that it could only have been one of the greater Nototheres, in all probability *Nototherium mitchelli*, Owen. It is perfectly mineralized in the usual manner, differing in no wise in texture and colour from well preserved contemporary fossils found elsewhere. Fortunately it is accompanied by a portion of the head of the same rib; in conjunction with which it corresponds in all essential features with a rib of *Nototherium mitchelli* among Queensland remains of that species. The length of the fragment is 154 mm.; by the loss of its central edge, which has been split off, its greatest breadth has been reduced to 42 mm. On its posterior aspect (Fig. 1), there is at (*a*) an obvious flattening of the upper part of the blade, the surface of the bone for a length of 65 mm. having been removed to an appreciable depth, and apparently by some mode of abrasion; near the distal end of the split edge on

the same side appears a marked hollow (*b*), at the bottom of which the cancellous structure of the interior of the shaft has been by the like means brought into view.

So far the abnormal features observable are not of intrinsic importance. They may have been the result of ordinary physical agencies of attrition. A similar explanation of the condition of the lower end of the bone, or at least of one edge of it, is, on the contrary, inadmissible. On its posterior face (Fig. 2) the rib has here been half sundered by a cut through its dense cortex (*c*), effected by strokes of a sharp instrument. A little lower down on its opposite face (Figs. 1 and 2*d*), it has been divided to a like extent, and the part beyond the two nicks so made has broken off, the line of fracture naturally occurring between them. The extreme edge of the fracture was thus brought to coincide with the inner edge of the lower nick, and this consequently presents a fairly sharp edge, rendered somewhat jagged by adherent remains of the internal cancelli. The surface of the lower nick (Fig. 1*d*) is convex in both its directions of extent, but whether this rounding off is the result of an original method of formation by filing, scraping, or shearing tool, or by the subsequent grinding of a surface in whatever way produced, is not to be gathered from the existing surface. In the latter case it is of course quite possible that this bevelled surface also might have been the outcome of mere physical action on a piece of rib lying in a watercourse or sand-drift, with one end partially exposed; it is even possible that the severance of the bone on this side of it was due to such cause. But these conjectures seem to be entirely forbidden by the complete absence of any sign of abrasion on the inner side of the edge of the nick; the broken walls of the bone cells, even at its extreme edge, are as sharp and prominent as they were left by their fracture, and we are therefore driven to the conclusion that this surface, however formed, was intentionally formed. That the surface of the upper nick—that on the opposite side of the bone (Fig. 2*c*)—could not have been yielded by any physical process, is on the other hand unquestionable. It is certainly the work of an animal possessed of a chopping instrument, and as far as we know the only animal of the age of the Nototherium that can excite even a passing suspicion is the so-called Marsupial Lion, *Thylacoleo*

carnifex, Owen, a confirmed bone-eater, with enormous shearing teeth. With the ossifragous capability of Thylacoleo we are not at this day unfamiliar, and experience makes it quite safe to say that the bone was not cut by the molars of that animal.

Powerful as its jaws undoubtedly were, they have left no evidence that they were able to cut through dense bone to any considerable depth, certainly not to the depth of 3 mm., as in the case before us. They chopped the surface (generally on opposite sides) but slightly, to a depth of a millimeter or so at the most, and by the impact of the blow or by continued effort crushed the bone in twain. The form of the incision is in itself sufficient proof that it was not the work of Thylacoleo. Its outer or upper edge, crossing the rib obliquely, is irregularly undulating, its surface inclined from without inward at an open angle, shows, under a certain incidence of light, three shallow, unequal undulations, or rather subconchoidal depressions which could only have been sculptured by an instrument having a strong bevel above its cutting edge. The surface of wear of the molars of Thylacoleo, which so frequently leaves its impression on the substance of long bones subjected to their action, is level, except that occasionally it is more or less distinctly bevelled off at its posterior end ; the cut effected by it across the shaft of a bone is therefore a straight edged and flat-surfaced notch. Of producing one with an edge which is even slightly scalloped and with a broad oblique surface of conchoidal facets, it is altogether incapable. We have, therefore, to fall back on an unknown user of an instrument adequate to the purpose, and this could not well have been any other than man. If now we are prepared to accept the view that this bone was wrought by human hands, and for the nonce assume the genuineness of the fossil, we shall have little difficulty in understanding how and why it received its shape. We may infer that the upper nick was first made ; afterwards, and probably with the same instrument—a small, sharp stone tomahawk—the lower nick ; the bone then broken between them, and the lower end ground with a bevel in order to obtain an edge which should be curved, moderately sharp, and rather rugose. Such would be an edge suitable for a scraper for the removal of flesh and fat from the inner side of skins and rendering the cleansed skins supple for use. Holding

the bone in position for this purpose, the tip of the middle finger falls into the hollow (Fig. 1*b*) and the base of the index on the flattened area (Fig. 1*a*); it is therefore not altogether unlikely that these abrasions of its surface are evidence of laborious usage if they were not superinduced on depressions purposely made in aid of the grasp. While the head of the rib remained attached to the working part of the shaft, the whole implement had a length sufficient for the employment of both hands, and effectiveness proportionate to the leverage obtained and power applied.

But though it may be thought beyond cavil that this bone has been purposely shaped, a question quite as important remains for settlement. When did it take its present form—as a green bone, or as a fossil? In other words, is it genuine or fictitious? Doubt as to the validity of its pretensions rose strongly and persisted obstinately in the mind of the writer when he found that from a similar piece of Nototherium rib he could with a pen-knife carve a very fair imitation of the fossil. But scepticism has succumbed to the explanation and assurances he has received during a lengthened correspondence with Mr. Hart and Mr. Vale, fortified by a statutory declaration of Mr. N. Kent, manager of the mine, to the effect that he received from the workmen the fossil covered with dirt, with a number of others in the same investment, and handed it in that condition to Mr. Vale. It is, of course, to be said that Mr. Kent's declaration does not go to the root of the matter. It does not disavouch the possibility that one of those who exhumed these bones and delivered them to Mr. Kent, had the opportunity, will, and ability to fabricate the one in question. We may, however, be content to set against this defect the unlikelihood that among the Ballarat miners there was one so far acquainted with ethnology as to know how to convert with so much skill a piece of bone into a scraper, or be led to do so by a knowledge of the interest that would attach to it; or, having done so, neglected to identify himself and his interests with the spurious discovery. He must have been a remarkably clever forger who, under the circumstances, made the chief nick exactly as it would be left by a stone tomahawk and not with a continuous surface; and who, moreover, carefully coloured that surface to disguise its rawness. How different its colour is to that of a fresh incision was ascer

tained by Mr. Vale, and is confirmed by a slight cut near the end of the bone, made by the writer. On the whole, then, it appears that although there are reasonable *a priori* grounds for suspecting that the rib was surreptitiously carved before it reached Mr. Kent's hands, yet the reasons against believing that it was actually so tampered with are insuperable. If, then, the bone received its present shape from the hand of man, and before it was buried to 238ft. below the ground, we cannot decline to see in it an implement fashioned out of a bone of a now extinct animal by a man to whom the living animal was familiar, since after fossilisation and the brittleness induced thereby, the formation of its chopped surfaces by a savage was simply impossible.

In an object which is believed to be the first to record the presence and indicate the condition of man in Australia in an age so remote, we cannot but feel a profound interest. It is at length permissible for us to imagine him to have been in conflict with the great Marsupials, fearsome reptiles, and other enormities of the prolific Nototherian age, and in his generation to have witnessed the vast physical changes which time has wrought upon his dwelling-place—changes on the whole so inimical to animal life that he was left with scarce a tithe of his former means of subsistence.

Permissible also is it for us to hope that this record is an earnest of further discovery of the kind.

The proof of its stratigraphical association with the other bones mentioned by Mr. Kent, although without bearing on the question of its genuiness as an implement, may by the way be stated. It is supplied by a peculiar phase of mineralisation common to all of them in the form of a secondary impregnation with a cementation by iron pyrites to quite an unusual extent. Mr. Vale, in one of his letters, remarks that this impregnation was much more evident in the fossil implement when first examined by him than it became after much handling; at present one fails to detect it.

The bones found with the implement are one and all derived from a species of Kangaroo. They have a special interest of their own, because the occurrence of even so many bones of the same skeleton together being unique, it affords most welcome guides to the identification of Macropodine bones scattered

through our collections. They consist of the greater part of a cranium, the symphysial region and part of the horizontal ramus of a lower jaw, portions of three vertebræ of a sacrum, pelvis, humerus, two femurs, tibia, and fibula, together with an almost entire foot. Although the proportions of some of these parts one with another are considerably different from those of their counterparts in existing Macropods, and caution us emphatically against placing unreserved reliance on the accuracy of any reference of an isolated bone with this or that species of extinct kangaroo, they do not exceed in difference what may fairly be attributed to adaptive modification, and are therefore not inconsistent with the belief that all of them belonged to a single skeleton. They are referable to a species named by the writer *Macropus faunus*.[1] The cranium in its present condition offers no distinctive characters worthy of note; any that may have existed originally have been effaced by a complete flattening and distortion of its component bones under incumbent pressure. The intermaxillaries, with their implanted teeth—with the exception of the left outermost incisor—have escaped material injury. The length of the third incisor equals the chord of the arc formed by the two taken together; this tooth is strongly notched at its anterior two-fifths. The cheek teeth of the same side—those of the right jaw having been destroyed—are all in place and intact; in structure they agree closely with those of the type of the species, but indicate by their greater degree of wear a more advanced period of age.

This notwithstanding, the premolar is still firmly in place, and shows no sign of speedy extrusion. The apparent permanence of this tooth makes it necessary to correct the impression conveyed by the words "procumbent on the verge of the diastema," in the account given of *M. faunus*. The writer was evidently misled in concluding from the overhanging position of the type premolar, that it had not long to remain in place. The persistent premolar and elongate notched third incisor associated with roundly lobed and strongly linked molars in *M. faunus*, are salutary admonishers of the fact that the dental differences shown by Macropus and Halmaturus in modern times,

[1] Pro. Lin. Soc. N.S.W., ser. 1, vol. x., p. 127.

were not invariably established in the earlier and more vigorous age of Macropod development. The palate, so far as can be gathered from its crushed remains, was nearly or quite entire. The remains of vertebræ and the fragment of the pelvis left to us, unfortunately, are too characterless to illustrate the axial skeleton, but in the appendicular bones there is much to interest us; more especially in those of the hind-quarters. Most of its members as the femur, tibia and fibula, would have been, and indeed have been, by virtue of their size, homologized with the teeth of the most gigantic of the Macropods, *Sthenurus goliah*, Clearly, the proportions of modern kangaroos form a very unsafe basis for specific osteology to work upon. The right femur is represented by the condylar end only. The remains of that of the left side include the head, the upper part of the shaft and the distal extremity. Placed alongside a complete bone, selected on account of its affording a fairly exact replica of the remains under examination, the latter indicate a total length of 375 mm. Apart from size, the most important difference between the femur of *M. faunus* and *M. giganteus* (259 mm. in length), is seen in the greater proportional depth of the inner condyle which is therefore much more nearly of the same size as the outer one. The effect of this would be to turn the animals toes outward, and thus enable it to take a broader base of support and more efficient grasp of the ground. The tibia, also of the left side, has also for its relics the head, part of the shaft and the lower articular extremity, the last cemented to the astragalus. Its head, in breadth, corresponding to the condyles of the femur, agrees in dimensions with that of a young bone in the Queensland collection, which, though it has lost its epiphysis, measures 700 mm. in length, and with its epipysis, would reach to 720 mm., a length which, other parts being proportionate, would indicate a bulk of carcass five or six times greater than that of an average example of the Great Kangaroo, *M. giganteus*. In contrast with this great development of the hinder parts, it is interesting to remember that the size of the head was comparatively small. On comparing the lengths of the lower series of cheek-teeth in the two animals, *M. faunus* would, on this base of calculation, appear to be not more than twice the size of *M. giganteus*. That its fore-quarters were disproportionately light, even for a kangaroo, appears further

in the shortness of the fore-limb. The humerus of the left side is in evidence. Of this bone we have the head, minus the lesser tuberosity, and the lower end of the shaft with a portion of the outer condyle and capitellum. The length of the head and greater tuberosity, 58 mm., bears about the same proportion to that of the cheek-teeth, as do the corresponding parts of *M. giganteus* one to another. On the testimony of this dimension the bulk of *M. faunus* might have been estimated as about two and a half times that of *M. giganteus*. A bone in the Queensland collection, so like this as to be referable to the same species, though previously attributed to *M. magister*, is 213 mm. in length, and 82 mm. in the breadth of its distal end. The remains of the fibula appear uninstructive; those of the foot on the contrary yield information of no little value; compared with the tibia it is shorter proportionately than that of *M. giganteus*, and, in this respect, stands intermediate between the Great Kangaroo of the plains and the Wallaroo, *M. robustus*, of the mountains. Though conforming to the Macropodine type of foot in the attenuation and syndactylism of its second and third toes, and the consequent slenderness of its metatarse, its free toes are usually broad, and in the form of their claws present a suggestive modification. The fourth ungual phalanx, in lowland kangaroos and wallabies, a long trilateral pyramid with straight edges and sharp angles, is curved on both its superior and inferior profiles, even more so than in Tree-climbing Kangaroos, Denarolagus, and has also near its distal end a marked curve outward. The fifth ungual phalanx is still more distinctly unciform; in general shape it might be compared to a hawk's upper mandible, with a rounded culmen and sharp lateral edges, of which the outer is dilated at about its posterior third. Sheathed with horn, this claw would ably support its colleague in securing a firm foot-hold on whatever surface the animal was wont to move. Reviewing the unusual concentration of weight and propelling power in the hind-quarters of the Fawn Kangaroo (if we may be allowed to give it a trivial name), the consequent lowering of its centre of gravity, its broad base of support and tenacious grasp on the ground, it is not difficult to surmise what were the habitat and mode of life of the animal. Who that has seen the Rock Wallaby at home can doubt that its feet and whole economy are fitted to scale heights

inaccessible to its congeners and their four-footed foes ; yet its foot and whole structure are not so well adapted to the search for safety and food among crags and precipices as those of our venerable acquaintance seem to have been. Its whole form evolved by and ministering to the needs of a mountaineer, rendered it a far more expert alpine climber than the living Wallaroo.